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material in addition to the catalogue number, when sufficiently large to permit of this without covering too much of the specimen. The small specimens are placed in numbered vials or boxes. In the Woodwardian Museum (Cambridge) type fossils are mounted on blue tablets. This arrangement, however, has the disadvantage of giving the exhibition series a checkered appearance, and should the specimens become loosened and displaced there is danger of the types being overlooked.

CHARLES SCHUCHERT.

THE FAUNA OF CENTRAL BORNEO.

In 1893 the Netherlands Commission, established for the purpose of promoting research into the natural resources of the Dutch colonies, united with a similar society formed in Batavia composed of merchants, financiers and government officers in organizing an expedition of scientists to central Borneo, a hitherto scientifically unexplored region.

Herr Büttikofer was the zoologist of the expedition and presented an account of its results to the third International Zoological Congress, held last year at Leyden, and his report has since been printed in the *Comptendu* of the Congress.

To zoologists it is hardly necessary to say that Herr Büttikofer is the distinguished curator of the Zoologischen Reichs Museum in Leyden, and the author of 'Reisebilder aus Liberia' (Leyden, E. T. Brill, 1890), the best zoological and sociological study of that country which has been made, and which in its minute descriptions of animal life is superior to any work upon any part of the African continent with which we are acquainted.

The work of the expedition was divided into six departments: Geology, Mineralogy, Botany, Zoology, Anthropology and Ethnography. Of these geology and mineralogy were assigned to Professor Molengraaff, of

Amsterdam; Botany, to Dr. Hallier, of Buitenzorg (Java); anthropology and ethnography to Dr. Nieuwenhuis, who was also medical officer; and zoology to Dr. Büttikofer, as before stated. Each had perfect control of his own department as to the field of research and the time to be spent. In anthropology and ethnography not much could be expected, as they require a much longer residence and acquaintance with the native populations than such expeditions usually afford.

"In my own department," says Herr Büttikofer, "I had the valuable assistance of a black man, Max Moret, a soldier in the Dutch army who had before accompanied Professor Selenka in his Borneo journey." "The natives became interested in my department and willingly lent me a helping hand."

Herr Büttikofer reached Batavia, November 1, 1893, and during his three weeks' stay in Java made an excursion to the Preanger regencies, and to the lofty mountains Gedeh and Pangerango, where he obtained among other specimens the very rare *Merula javanica*. Leaving Java on November 17th, he landed at Pontianak, on the west coast of Borneo, and ascending the mighty river, Kapuas, established a central station at Smitau. The river being in flood, the hunting was confined to birds and other tree-living animals, and many new specimens were obtained.

In December they moved on to Mt. Kenepai. (1200 metres), near the borders of Sarawak, where on higher ground a better field was found. Ascending the mountains, they pitched their tents half way to the summit and found the life most romantic. "In the early dawn we were awakened by the loud jodelling of gibbons and the ear-splitting shriek of the Rhinoceros birds, after which, as the morning advanced, the other members of the winged orchestra joined in the chorus."

The rain and fog and the resulting humidity were very annoying, as the specimens dried at the fire when taken away, immediately became wet again. "The orangutans amused themselves by swinging in the tree tops over our heads." From the isolated peak of Kenepai the view was beautiful and disclosed here and there in the forest-covered plain the waters of the Kapuas and Kenepai stretching out into a chain of lakes; on the north Mt. Tutup reared its head, its foot hills forming the southern boundary of Sarawak.

Returning to Smitau in February, 1894, the specimens were prepared for shipment, and at the end of the month a new start was made for the Mandai river, one of the principal tributaries of the upper Kapuas, and having its source in a great group of mountains, which sends out the Mandai and the Melawi on the west, the Barito on the south, and the southern tributaries of the Mahakkam, on the east coast. Ascending the Kapuas to the mouth of the Mandai, the journey was pursued in small boats, through a flat, uninteresting and tiresome country, until the rapids were reached.

At Nanga-Raun, the next stopping place, reached in five days, they built a roomy hut. In that mountainous region, Herr Büttikofer chose for exploration Mt. Liangkubung. About 2,500 feet up its side he camped in one of the dry grottoes, inhabited by large numbers of the native Punans, and there remained from the 10th of March to the beginning of May, 1894.

The hunting, while rough and tiresome, gave excellent results, and many new specimens were procured, such as the *Sciurus whiteheadi* and the *Calyptomena hosei*, heretofore only known in north Borneo. Fresh foot prints of the rhinoceros were also seen; on the summit the only evidence of life in the grave-like silence was the forest blood-leech, the pest of the mountain climber in Borneo, which fell upon them murderously.

Returning to Poetoës Sibau on the 5th of May, Büttikofer and party went up the Sibau as far as Poelau, the only settlement in the whole Sibau valley, and again returning to Poetoës Sibau, joined Dr. Nieuwenhuis and Professor Molengraaf in the journey to the Mahakkam region. Concluding his *résumé* of the various journeys he remarks: "I confined my work to the region of the upper Kapuas, under the equator, because of the isolation of the district and the ignorance concerning it, and as a result I lack many specimens of species belonging to the coast."

The mammalia and birds of Borneo can best be compared with those of the known islands of the East Indian archipelago, and I have, therefore, few new specimens, although working in an entirely unknown region. This demonstrates that the fauna of the Kapuas region is identical with the Sarawak and upper Borneo. I am of the opinion, as a result of my observation, that the lateral diffusion of animals is of much greater interest than the altitudinal, and that this observation can be used to illustrate the speculative theory of the elevation and depression of the Malay archipelago and the island of Sundain.

While Borneo, from a zoo-geographical point of view, resembles Java and Sumatra and the adjacent islands, as well as the peninsula of Malacca, it nevertheless shows a constant tendency to deviate. For a good classification of the mammalia of Borneo we have to thank an Englishman, Mr. Chas. Hose, who gives 146 species, of which he has collected the greater part. The number found by me in the Kapuas region is about 66, divided as follows: Apes and Lemurs 12, Bats 18, Insectivora 10, Carnivora 7, Rodents 13, Artiodactyls 3, Perissodactyls 2, Edentates 1.

Among the mammalia the greatest interest centers on the orangutan, which is met with in the mountain region dividing Dutch

Borneo from Sarawak. It seems to avoid the valley forests as well as the higher altitudes, the central region of its dispersion being between Sambas and Batang Lupa-Seen. There they are so plentiful that Moret, who after my departure hunted for them to gather embryo material, found in that region alone 139 specimens in 3 months. How far north this distribution reaches cannot be ascertained from Mr. Hose, who himself does not seem to have met them. I conclude that the northern limit of distribution is not above southern Sarawak.

Eastward the distribution is limited, and it is not found east of Batang Lupa-Seen, and to the Sibau-Djaks it is only known by name. At the sources of the Kapuas it is not found. The cause of this limited distribution is not obvious, for the region of wild figs and similar fruit greatly exceeds its range and the climate does not vary. Another region in which it is found is the great alluvial plain of south Borneo, where it inhabits the swampy forests as far as the coast. The numerous specimens in the Leyden museum came from this region. Their color varies from a dusky red to a russet brown.

The attempt has been made to separate the dark varieties into a distinct species to which the name *Simia morio* has been given.

The orangutan lives exclusively in the tops of the trees and in his search for food covers a large territory; it does not like the gibbons, which are much more active, swing itself to a great distance, because of its great size, and is sometimes forced to descend. After eating it can be hunted with great ease by a practiced shot, but unless mortally wounded or shot in the arms it is impossible to bring it down. If a mother is shot with her young by her, the latter can be easily captured and readily tamed. The habit of the *Maias* (which is the Djak name of the orang) is to build itself a nest which he uses at night.

In the forests of the Kenepai, where it is often met with, we found so many of these nests that I am convinced that it does not occupy the same nest every night, but builds them when necessity requires. They are about the size of an eagle's nest, and are often found on small young trees; and not much skill or pains or uniformity of design is shown in building them.

The gibbon is much livelier and lives in small communities of five or ten individuals; it by preference inhabits the mountain forests, and I have found it at an attitude of 900 metres, while in the river valleys it is seldom found. They rush through the forest with great noise and crying, swinging from tree to tree; the Djaks call them *mblian*. The varieties are two, light and dark; the former named *Hylobates concolor*, the latter *H. Mülleri*.

The proboscis monkey has his home on the banks of the rivers and never ascends the mountains. I found them near the mouth of the Palin river as it flows into the Kapuas. They live in small families of 5 or 8 and are not at all shy; a living specimen I obtained was quite white, and his nose was just a little elongated.

A very pretty animal is the lemur (*Nycticebus tardigradus*), most plentiful in the lower Kapuas, but not found much above Sintang; of these I collected several living specimens. The tarsier (*Tarsius spectrum*) is not rare in the lower river regions and is brought living, for sale by the Malays. On the day of my arrival at Pontianak, I bought a flying lemur (*Galeopithicus volans*), which I kept alive. Of the insectivora the *Tupaia*s, or tree shrews, are most numerous. The *Gymnura alba* is much rarer and more interesting. The Malays, because of its nocturnal habits and appearance, call it *tikus bulan*, which means moon-rat; in color it is a dirty white with a stiff, spindle-shaped, naked tail. In the daytime it lives among the roots of the trees and burrows

in the ground, and is easily located by its musky odor.

The seven carnivora in the Kapuas region, with the exception of one cat, one otter, and the Malay bear belong to the civet cats and the *Ichneumons*. Of the 13 rodents the squirrels are the most numerous, and among them are two very pretty species, *Sciurus melanotis* and *Sciurus whiteheadi*. In the same locality we found the giant of the squirrels, *Rheithrosciurus macrotis*, which lives on the ground and is distinguished by a large bushy tail, and which is universally distributed over Borneo, but is nowhere plentiful. We also found flying squirrels and on the Kenepai a small species of porcupine

Of the artiodactyls, the deer family has three specimens — the sembar (*Cervus equinus*), the muntjac (*Cervulus muntjac*), and the small musk deer (*Tragulus kanchil*); all are common in the Kapuas region and are caught by the natives. I have already mentioned the Rhinoceros; the remaining animal is the bearded pig (*Sus barbatus*), which lives on the shores of the Kapuas and is very numerous. His food is preferably earth worms, which are so plentiful that in poling in the mud of the river one pulls out more worms than earth. Because of his light skin and scanty hair the wild pigs appear white. In closing Herr Büttikofer calls attention to the preponderance of the arboreal animals, and states that of the 66 species found by him 52 are arboreal. "This preponderance is not found elsewhere in similar geographical conditions, either in Celebes, Africa or America; a preponderance which cannot be due to the priority of beasts of prey living upon the ground, for, as has been shown, they play no part in Borneo, and the tiger is unknown. It must be due to the forest covering of the island and to the yearly floods."

This imperfect *résumé* of Herr Büttikofer's paper will, perhaps, suffice to indi-

cate its value to the zoologist and to suggest to the layman its romantic interest. We shall anticipate the pleasure of reading the forthcoming report which is to contain the combined results of the Borneo expedition.

GEORGE R. STETSON.

WASHINGTON, D. C.

SEMON ON THE MONOTREMES.*

AMONG the contributions to zoological literature which have appeared in the reports of Dr. Richard Semon's expedition to Australia and the Malay Archipelago, perhaps none have more popular interest than the papers by Dr. Semon himself on the habits and development of the Monotremes.

Both *Echidna* and *Ornithorhynchus* were studied. In neither of these animals is maturity attained until the end of the second year. The male *Echidna* is considerably larger than the female. In both genera the testes increase greatly in size during the breeding season, and the female *Echidna* develops a marsupium which disappears when no longer required by the young. The breeding season of *Echidna* begins late in July, and *Ornithorhynchus* commences to breed a little later, or about the middle of August. A striking ornithic character is that eggs from only the left ovary are fertilized, although the right ovary and oviduct appear to be well developed. The usual number of ova is one in *Echidna* and two in *Ornithorhynchus*. The egg is fertilized before or about the time of its entrance into the oviduct, and is at this time about four millimeters in diameter and nearly spherical, but during its sojourn in the genital passages a shell, composed of keratin, is secreted, and the egg (in *Echidna*) increases in diameter to about fifteen millimeters by absorption of uterine secretions. Both animals are oviparous, and in *Echidna*

* Zoologische Forschungsreisen in Australien und dem Malayischen Archipel. Von Dr. Richard Semon. Zweiter Band, I. Lieferung. Jena, 1894.